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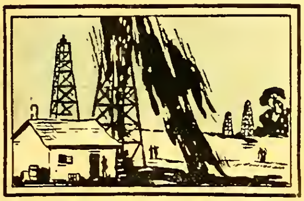
# Louisiana Conservation REVIEW



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Louisiana Nature Guardians

*Published Quarterly by the*
**DEPARTMENT OF CONSERVATION**

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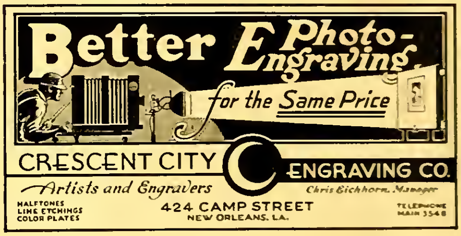

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# LOUISIANA CONSERVATION REVIEW

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## Oil Pollution and Oyster Beds

THERE has just been issued by the Bureau of Fisheries of the U. S. Department of Commerce an extremely valuable report on a subject of grave interest to Louisiana entitled "Effects of Crude Oil Production on Oysters in Louisiana Waters." This is the work of Dr. Paul S. Galtsoff, Dr. Herbert F. Prytherch, Robert O. Smith and Dr. Vera Koehring.

The Louisiana Department of Conservation in January, 1933, received reports of disastrous oyster mortality in certain coastal areas adjacent to relatively recent oil developments. The Bureau of Research of the Department of Conservation, in co-operation with the Division of Oysters and Water Bottoms and the Division of Fisheries, conducted field surveys which strongly suggested that a relationship existed between the activities resulting from the drilling of the oil wells and the heavy death rate of the oysters.

One confusing factor was that no simple pattern seemed to exist in the spatial relations of the damaged oyster beds and the oil wells. In other words, some beds near the wells were less affected than other beds farther away.

The Bureau of Research of the Louisiana Department of Conservation conducted further field surveys and thereafter initiated both field and laboratory experiments. This work on the part of the Bureau of Research of the Department of Conservation extended altogether over a period of one year and seven months, and gave convincing evidence that oil when it comes in contact with sea water so alters the sea water in some way that oysters exposed to such sea water show a heavy mortality in contrast with the absence of such mortality in "control" oysters held in similar tanks receiving sea water from the same source of supply but without contact with crude oil.

Repetition of these experiments completely confirmed the results of the first series and demonstrated clearly that it was not necessary for the oil to come into actual contact with the oysters to cause mortality. The inevitable conclusion that crude oil constitutes a dangerous agent of pollution in relation with oyster culture led the Department of Conservation of Louisiana to promulgate and enforce special regulations directed to abate this damage.

The detailed mechanism whereby oil polluted sea water causes damage to oysters could not be adequately investigated by the Department of Conservation whose primary purpose was simply to establish whether or not oil-polluted sea water damaged or killed oysters.

It is, therefore, particularly gratifying to have now available in scientific literature the report above indicated.

Investigators of the Bureau of Fisheries conducted extensive studies

(Continued on Page 27)

## How Many Ducks?

EVEN in these days when federal appropriations have used up all the zeros on the linotype machines, 42,700,000 wild ducks seem nevertheless an appallingly large number. Yet to count these 42,700,000 ducks was the task set for themselves by "More Game Birds in America," of 500 Fifth Avenue, New York City, a non-profit foundation and organization sponsored by the leading business men in the United States. The publication presenting their results entitled "The 1935 International Wild Duck Census" has just come to hand and affords interesting reading for every hunter of waterfowl. Uniting closely the cooperation of federal agencies of both the United States and Canada, together with the various State and Canadian Provincial agencies, a program of investigation that appears at first glance almost impossible was planned and carried into successful execution. On foot, by boat and by airplane, the investigators did their best to estimate by actual counts in chosen typical areas the ducks that inhabit a total of 995,631 square miles. Over 760,000 of these square miles were in Canada, over 230,000 in the United States. The air surveys flown by the seven planes used totalled over 15,000 miles.

There is no space here to enumerate either the techniques adopted or all of the major results obtained, but certain conclusions are of profound interest.

It has been the fashion for many people to deride attempts at making censuses, but it would seem to anyone carefully reading the account of the conduct of this census that such derision is quite unjust. No matter how great the task, it is evident that a carefully considered, well planned and arduously accomplished program must inevitably give a more useful result than the often "arm chair" guesses of unorganized groups.

Air travel by privately chartered airplanes made possible the examina-

(Continued on Page 28)

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# CYPRESS

## An Appreciation

(Photograph by courtesy of American Forests, Washington, D. C.)
A Southern Swamp is a Study in Sunlight and Shadow

Of all the trees which abound in our Louisiana forests not one surpasses in picturesque loveliness and commercial importance the lordly Cypress. The young trees, so trim and straight, with regular, outstretched branches, tipped with rough, green balls, remind one of the toy trees of childhood play boxes; while the giant veterans, with huge enduring bodies, many times from ten to sixteen feet in diameter, tapering up to slender fingers, fill us with awe and admiration.

The deciduous, or Swamp Cypress, enjoys its Louisiana home, for it flourishes best in lowlands, in the damp, rich muck of bayous, sloughs and undrained fields. Under these conditions it grows to gigantic stature, many times towering to one hundred and seventy feet and more. In its surrounding area it sends up an unusual growth, called "knees", hard hollow semi- circular cones of varying heights.

These trees are found scattered well over the United States and Mexico, and have the distinction of being one of the first American trees introduced into England. It is described by John Parkinson in his Herbal of 1640.

It is prodigal in its beneficence to man, and should it pass from the earth many factories would close their doors and countless mills would cease their busy whir.

Of all materials in the mineral, animal or vegetable kingdom there is not one so easily worked into so many and varied articles—and with so few tools—as Cypress; only an ax being needed!

One huge tree can supply to man all that is needed for a fair habitation.

We begin with foundation blocks and solid sills; we raise walls of smooth, straight plank and spread floors which bear well the tread of many feet; we cover our roofs with time-defying shingles and our yards are trimly enclosed in fantastically pointed pickets and enduring Cypress posts. These posts are often made of what is known as "pecky Cypress," wood wherein the quality has been impaired by little tunnels and burrows, the result of insect invasion, but which is especially lasting when placed in direct contact with the earth.

Clapboards, roofs, split fences and the hewed beams of old houses stand in mute and magnificent testimony of the value of this great wood to man.

In the beginning of life he is often times rocked to sleep in a Cypress cradle, and he lies down to his last, long rest in a Cypress coffin!

To those of us who love trees each one has a distinct personality.

Birches, in their silver delicacy, seem to me like young girls emerging tremulously into woman-

By
**HELEN MURPHY,**
**Tallulah, Louisiana**

hood; tall, slim poplars, straight and prim, are maiden ladies, met together to gossip decorously; maples and gums are gay minxes who flaunt their brilliant beauty wantonly; great oaks are patriarchs—and on and on we personify our forest friends.

But not one has taken on the individuality of an old Cypress I knew in my youth.

It stood alone, tall and commanding, in a shallow slough which bisected the stretch of cotton field in front of my home. Its great, tapering body was boldly etched against the sky and its branches, in their feathery foliage, reached out like supplicating arms.

At all hours of the day I watched it, and it assumed symbolic forms to my young mind.

In the clear, rosy light of morning it seemed a gallant young warrior, clad in silvery armor, standing in proud disdain of time and disaster.

In the hush of evening when shadows fall it became an old man, tottering and weary, bearded in grey moss, patiently waiting, waiting!

Then, again in the moonlight my frightened, but fascinated, eyes would fasten themselves upon my old friend, weird and spectral—so far away—and I would lift my childish hands and cry.
"Take me up to your great heights old tree!
Waft me away to the land of 'make believe'
Where dreams are made and spirits come at will!"

### CYPRESS

But only the night wind would echo my cry, and the whir of a bat's wing and the eerie sounds of darkness would frighten me back to the light and life of home.

The memory of this old tree, so far away, has been most vividly brought back to me in the past weeks when a desultory procession of heavy trucks has thundered past my door, ladened with Cypress logs in transport to a sawmill a few miles north.

(Photograph by courtesy of American Forests, Washington, D. C.)

Trees and Water Mingle in Mysterious Pattern

Such wonderful logs!

In their immensity, their soundness!

Usually there could be but three lengths to a truck, so great they were; but one day there came a juggernaut truck, bearing one stupendous log—a magnificent, deposed monarch on his funeral car! My heart missed a beat as I thought "How like the old Cypress of my youth!" and I sent up a little prayer of thanks to the mighty river which had long since claimed my old tree for its own and had borne it away on its swirling current—safe from the dismembering mills of man—to float in peace on distant seas to a lasting haven on unknown shores.

# Louisiana's Highways

*EDITORIAL NOTE—It is extremely difficult in the year of Our Lord 1936 to project ourselves backward to the very earliest conditions of primitive Louisiana when its meshwork of bayous and streams offered the only means of convenient travel. It is not difficult, however, to project ourselves over the few intervening years to that recent time when Louisiana's lack of highways and lack of bridges made travel difficult, uncomfortable and often hazardous.*

*A student of exploration once very aptly said that "the Indian idea of a road is to white men little more than the possibility of reaching a distant place alive." That certainly described many Louisiana roads only a few years ago.*

*The extraordinary accomplishments that have been the result of the thought and work of the late Senator Huey Pierce Long are much the more wonderful when there is considered the almost incredibly difficult character of the terrain over which this highway system was built.*

*Last month within a period of eight days Louisiana witnessed the opening and dedication of three most significant projects. On December 20, the opening of the "Cut Off", creating a new accessibility to the Gulf Coast at a cost of one and a third million dollars. On December 13, the Bonnet Carre Spillway and Bridge, a cooperative project costing thirteen million dollars, and designed to assure New Orleans of freedom from flood dangers. On December 17 of this epoch making ten days there was dedicated the magnificent Huey P. Long Bridge over the Mississippi River, the largest railroad and vehicular bridge in the whole world, a marvel of engineering achievement linking Eastern Louisiana with Western Louisiana and the whole of the eastern South with the West. This towering and graceful structure, costing thirteen million dollars, was dedicated with appropriate ceremonies a brief two months and seven days after the statesman whose name it justly bears was struck down, fatally wounded by a cowardly assassin.*

Another of Senator Long's splendid monuments, the State Capitol at night.

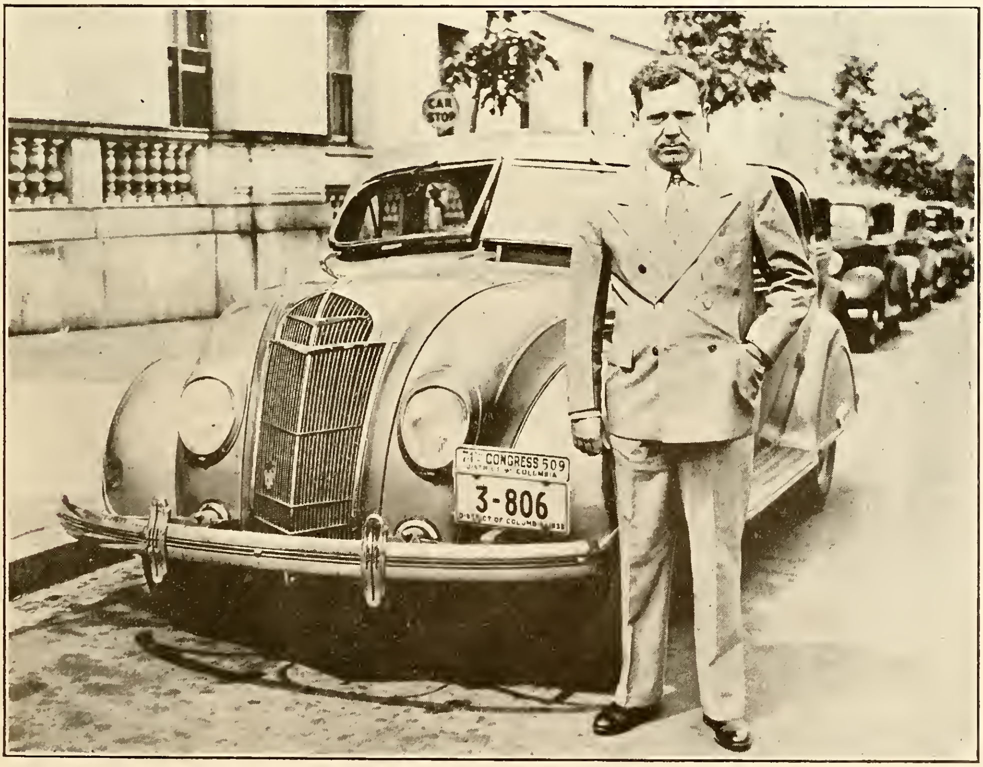
*The Louisiana Conservation Review takes much pleasure in presenting herewith some photographs of a few points in the vast system of highways and bridges which bring to even the remotest parts of our State the advantages that the most skillful modern engineering can achieve. Through the courtesy of the Louisiana Highway Commission these illustrations have been made available, and through the courtesy of the Honorable A. P. Tugwell, Chairman of the Louisiana Highway Commission, Mr. J. A. Kinkead, Office Engineer, has prepared the brief appended statement.*

*It is probable that no single one of the innumerable accomplishments that have been achieved under the administration of Senator Long as Governor and under the administration of Governor Allen has more profoundly affected and improved the lives of all citizens of the State from north to south and east to west than has the creation, under almost impossible conditions, of the finest existing system of modern roads and free bridges, making virtually all citizens of the State relative neighbors.*

The following is the statement kindly provided by Mr. J. A. Kinkead, Office Engineer of the Louisiana Highway Commission:

Highway construction was first undertaken as a State obligation in Louisiana in 1911. Between that time and the year 1928, although automobiles and trucks had rapidly increased to a registration of 225,000 vehicles, practically no paved highways were constructed nor in prospect and the larger streams could be crossed only by means of privately operated toll ferries. During this period of seventeen years only gravel roads had been built to serve the increasing concentration of automobile traffic and apparently there was no expectation for the automobile driver other than to continue to travel these inadequate highways surrounded by a cloud of dust. Such was the physical aspect of the Louisiana Highway System when Huey P. Long was inaugurated Governor.

Governor Long, scanning this situation, realized that an adequate highway system was so long overdue that it must be constructed with the utmost expedition; that it must consist of a net work of paved trunk highways interconnected



A portrait of the late Senator Huey Pierce Long taken in Washington, D. C.

East Pearl River Bridge, Rigolets-Pearlington Highway, St. Tammany Parish and Hancock County, Miss.

with feeder and farm-to-market roads; and that the major streams must be spanned with free bridges.

Obviously the more pressing problem presented by this program was to provide the adequate funds since the construction of paved highways and large bridges requires larger sums of money than current revenues could provide. The work and energy necessary to secure the approval of the people for the flotation of bonds necessary to finance this program is a long and interesting story in itself but it is sufficient here to say that this step was accomplished.

The next step was to direct attention first to the paving of the principal highways since this procedure would bring the quickest relief to the largest number of automobile owners. When this part of the program was well advanced attention was directed to the construction of the major bridges and to the gradual construction of feeder and farm-to-market roads so that the entire program of highway development could proceed uniformly and in balance.

It is impossible to show on paper the work accomplished by the Louisiana Highway Commission since the inauguration of Huey P. Long as Governor of Louisiana. To fully appreciate this work one must have been familiar with the physical condition of Louisiana highways in 1928 and at the present time. However, for those who have had no opportunity to make a personal visual inspection and comparison of Louisiana highways then and now, the following is offered for their reflection.

**Highways Constructed**

1911-1928—17 Years.

| | |
|---|---|
| 3,207 miles gravel | $32,700,000 |
| 88 miles pavement | 3,100.000 |

1928-1935—7 Years.

| | |
|---|---|
| 4,858 miles gravel | $44,400,000 |
| 3,160 miles pavement | 67,700,000 |

**Bridges Constructed**

(These figures represent the contributions on the part of the Louisiana Highway Commission, the total cost, in co-operative projects, being often greatly more.)

| | |
|---|---|
| Mississippi River (New Orleans) | $7,000,000 |
| Atchafalaya River (Morgan City) | 1,200,000 |
| Rigolets Pass | 1,130,000 |
| Atchafalaya River (Krotz Springs) | 950,000 |
| Bonnet Carre Spillway | 850,000 |
| Red River (Shreveport) | 800.000 |
| Chef Menteur Pass | 610.000 |
| Ouachita River (Monroe) | 540,000 |
| Black River (Jonesville) | 510,000 |
| Red River (Alexandria) | 465.000 |
| Ouachita River (Columbia) | 452.800 |
| Red River (Coushatta) | 450,000 |
| Red River (Moncla) | 330,000 |
| Industrial Canal (New Orleans) | 305,000 |
| Ouachita River (Harrisonburg) | 302,000 |

| | |
|---|---|
| Ouachita River (Sterlington) ........ | 250,000 |
| East Pearl River (Pearlington) ...... | 105,000 |
| Amite River (near Baton Rouge) .... | 190,000 |
| Mermentau River (Lake Arthur) .... | 150,000 |
| Three Rivers (near Columbia) ....... | 145,000 |
| Little River (Jonesville) ............ | 130,000 |
| Caminada Bay (Grand Isle) ......... | 120,000 |
| Bayou DesAllemands (DesAllemands) | 115,000 |
| | $17,099,800 |

The following extracts from the Seventh Biennial Report of the Louisiana Highway Commission describe interesting engineering problems which were met with and solved in the building of some of Louisiana's wonderful bridges:

"The completion of several of these bridges was accompanied by some very interesting and unusual features of construction. For example, the main span of the bridge over Red River at Shreveport, dedicated as the 'Long-Allen Bridge,' is a 520 foot riveted steel cantilever span, having anchor arms 280 feet in length. This bridge has a 40 foot clear width of driveway in addition to two 5 foot sidewalks, and the erection of the main span without falsework in the river presented several problems in precise construction and engineering. The central 20 ft. of this 520 ft. cantilever span is really a suspended span since the bridge is completed, but during erection was erected as a cantilever with temporary tie-backs involving adjustable toggles until the erection equipment could be moved around to the other side of the river, and the same erection operation carried out as before, and the closure was made in mid-channel in the center of the suspended span in mid-summer of 1933, without any difficulty whatever due to the careful planning of the contractors and the engineers.

"In the construction of the Atchafalaya River Bridge at Morgan City piers were sunk to very unusual depths in order to secure adequate foundations, particularly pier No. 3 of this bridge was sunk by pneumatic and open dredging to a depth of 176.5 feet below Mean Low Water, and this pier was sealed by the us eof a tremie at a time when the depth of pier was 179 feet below water elevation. We understand that this is the deepest bridge pier in the world below low water. The erection of the three 608 ft. fixed spans presented a very unusual problem in steel erection. Due to

The Huey P. Long Bridge. A beautiful masterpiece of engineering skill dedicated barely two months after the assassination of the late Senior Senator from Louisiana.

Black River Bridge at Jonesville. Catahoula and Concordia Parishes.

the depth of water and the soft material on the river bottom the contractors elected to erect these spans on falsework adjacent to the river bank and float them in place, using large steel barges. This operation was carried out in the summer of 1933, floating each 608 ft. span on three steel barges 27x175 feet, erecting and moving these spans at their final elevation which was approximately 58 feet above mean water elevation. These spans weighed at the time they were floated, approximately 1400 tons each and the top of the span was approximately 150 ft. above the water surface. Each span was moved from the falsework to the piers in less than two hours' time. There was an interval of only about one month's time between the floating of each successive span, and all three spans were erected on the same falsework.

"In the construction of the Atchafalaya River bridge at Krotz Springs several interesting problems were encountered and overcome. The four main piers of this bridge are similar to the main piers of the Morgan City Bridge, and were sunk by a combination of pneumatic and open dredging to a depth of approximately 140 feet below low water. The natural ground elevation at the site of the two bank piers is approximately 30 feet above low water elevation, and consequently these two piers were sunk to a penetration of approximately 170 feet in material varying from gumbo clay through silt and sand to gravel. One of these piers was sealed with a tremie when the water elevation was about 33 ft. above low water stage, or in other words, at a depth of approximately 173 ft., a depth only slightly less than that at which pier No. 3 of the Morgan City bridge was sealed. In the erection of the three 500 ft. spans at Krotz Springs, the two outside or bank spans were erected on timber falsework. The channel span was erected as a cantilever supported by tie-back beams from the hip joint of each of the two outside spans. The erection of the channel span proceeded simultaneously from each side of the river toward the center without the use of falsework, and the length of the tie-back beams was such that when the two half spans were erected to the middle of the river, the ends would be two feet above the grade on the completed bridge. Then by using a number of jacks under the approach ends of the bank spans and jacking up these ends of these spans the channel span would be brought down to its final position and the final connections made first in the bottom chord and then in the top chord. The erection has now been completed successfully due to the careful planning and control of the operations by the contractors and engineers.

"It is interesting to note that the Atchafalaya River bridges at Krotz Springs and Morgan City are constructed on unusually deep piers for the reason that considerable scour is anticipated in this river due to the construction of the Atchafalaya Floodway, and one of the conditions of the War Department's approval of the construction of these two bridges was that no mattresses or revetment work be placed in the river bed to protect the bridge piers from scour. With this condition present it was considered advisable to carry piers at both of these bridges to such a depth that they could not reasonably be expected to be damaged by the scouring action of the current in this floodway.

### *Huey P. Long Bridge at New Orleans*

"Bids were received September 15, 1931, for the construction of the Huey P. Long Bridge over the Mississippi River at New Orleans. The award of the contract and the beginning of work was delayed until late in 1932 on account of the difficulty in selling the bonds authorized for construction of the project. The Louisiana Highway Commission is participating in the cost of this project to the extent of $7,000,000. or fifty per cent (50%) of the total estimated cost, which will make the highway portion of the bridge toll-free for highway traffic. . . .

"The engineering on the project, including the original surveys, preparation of plans and supervision of construction, is being handled by Consulting Engineers Modjeski, Masters & Chase of New York City. Plans were approved by the Louisiana Highway Commission and the Public Belt Railroad Commission. The bridge consists of one 790 ft. cantilever span over the main channel on each side of which is a 530 ft. anchor arm span. There is also one 530 ft., one 330 ft. and three 270 ft. simple truss spans, making the total length of the main bridge 3,520 feet long."

---

## TO THE MEMORY OF HUEY P. LONG AFTER HIS ASSASSINATION

*List! 'Tis an Angel's whisper*
*Calling home a priceless soul*
*In one hand he holds a chalice*
*Filled with gifts more rare than gold.*

*Now bending low the Angel*
*Leaves a kiss of peace on earth*
*Soon he takes that soul to heaven*
*To the home that gave it birth.*

*Many souls are filled with sadness*
*How they'll miss that loving one*
*Who led them o'er life's rugged pathway*
*'Till his tender task was done.*

*But his spirit lingers near them*
*And his words of tender lore*
*Help them bear the cross so heavy*
*Though they miss him evermore.*

*Strength, my God! must be the watchword*
*Of the sad and suffering hearts*
*Those with whom he loved to linger*
*Souls from whom he loath would part.*

—*Virginia M. Fassman.*

Atchafalaya River Bridge at Morgan City. St. Mary Parish.

# Injury to Black Locust Seedlings

## In Forest Nurseries in Mississippi and Arkansas by the Lesser Corn Borer

By

**THOS. E. SNYDER,**

Senior Entomologist, Forest Insect Investigations,
Bureau of Entomology and Plant Quarantine,
United States Department of Agriculture.

### DESCRIPTION OF INJURY TO CROPS

In the southern part of the United States corn is sometimes injured by the lesser corn stalk borer (*Elasmopalpus lignosellus* Zeller), the slender greenish caterpillars boring into the lower part of the stalk and in the heart of the plant. Corn under 18 or 20 inches high attacked by this insect becomes much curled and distorted. In addition to corn, the insect feeds on peas, beans, peanuts, cowpeas, crab grass, Johnson grass, wheat, turnips, and probably several other crops.

During 1934 this crop pest was first reported to be causing serious injury to black locust seedlings in forest nurseries in Mississippi and Arkansas. The borer girdled the stems of young plants as shown in figures 1 and 2.

### DISTRIBUTION

The insect is distributed from eastern Massachusetts to southern California, but it is largely confined, so far as injury goes, to the more Southern States. It is also found in Mexico, Central America, and South America.

### LIFE HISTORY, APPEARANCE, AND HABITS

The insect hibernates in the larval and pupal stages, and possibly in the adult stage, but in the Southern States it usually passes the winter as a larva, which transforms to a pupa before spring. The moths emerge from the pupae skins, or become active in the Gulf States, early in the spring and lay their greenish-white eggs on the leaves of the plants on which the larvæ feed. The eggs hatch in about one week; the caterpillars feed at first on the leaves, but soon burrow into the stems of corn and other plants at or slightly below the soil surface. The larvæ become full-grown in about 2 or 3 weeks. They frequently kill the growing point or "heart" of the plant and remain hidden in silk-lined tunnels in the soil. The insects leave their burrows when full-grown and, under trash on the surface of the ground, spin silken cocoons in which they change to brownish pupæ about one-third of an inch long. From these the moths emerge in from 2 to 3 weeks. They have a wing expanse of nearly 1 inch. The front wings are brownish-yellow, with grayish margins and with several dark spots. In the female the front wings are nearly black.

A second generation is produced in all the Southern States where this insect is injurious. The second-generation adults fly during September in the Gulf States.

### INJURY IN FOREST NURSERIES

One to 2 percent of the stand of black locust seedlings was killed by the lesser corn stalk borer at the forest nurseries of four CCC Camps near

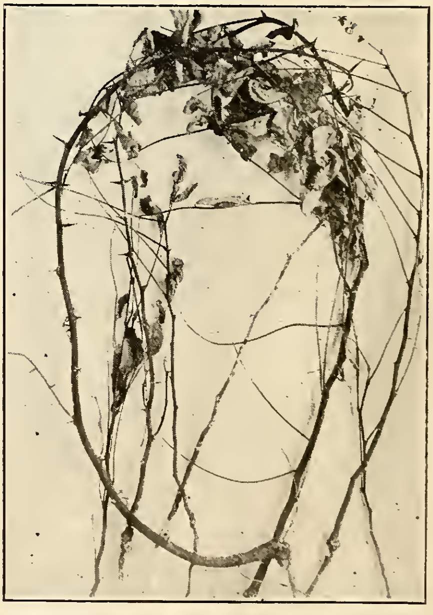


Fig. 1. Injury to woody stems of young black locust seedlings by the lesser cornstalk borer. Note gall-like swelling at point near ground line.

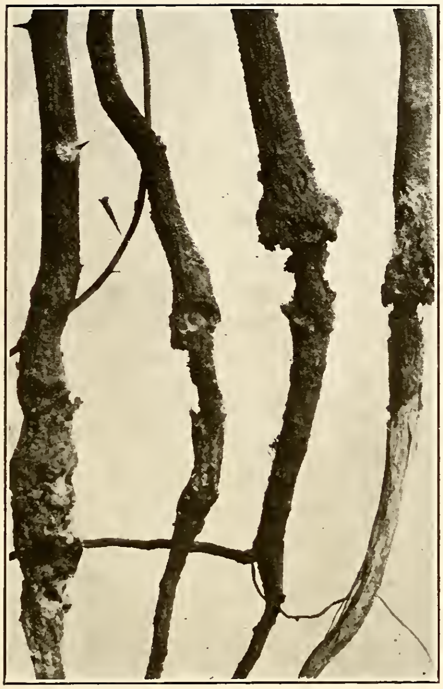


Fig. 2. Enlarged view of stems of black locust seedlings to show girdling injury and gall-like swelling.

Holly Springs, Miss., late in August and in the middle of September in 1934.[1]

Young seedlings (6-18 inches in height) were cut off and girdled or eaten into at or slightly below the ground line. When the seedling is not immediately killed, a gall-like swelling is formed on the woody stem, at the point of injury (figures 1 and 2). The caterpillars retreat or take refuge in a web attached to the seedling below ground; when disturbed they do not coil up in a semi-circle as do cutworms but maneuver about with quick jerky movements, somewhat like a cheese skipper. Injury was most severe where the soil was sandy. There was no further injury after October 1. Similar injury occurred at Conway, Ark., in 1934 and 1935.

During 1935 but little injury has been reported from forest nurseries near Holly Springs, Miss., where control measures were instituted in 1934, but considerable losses have been reported in the forest nursery at Conway, Ark.

### CONTROL MEASURES

As in the case of the common stalk borer, practically the only effective control is in fall or winter clean-up of the fields and field margins. Winter plowing has given control in some cases, or is at least helpful in reducing the numbers of the insects in the field. Early planting also is recommended in some sections in the Southern States as a control for this pest.

There is some evidence, from experiments made in Mississippi, that the use of poisoned bait will be effective in keeping down the numbers of these borers. This bait may be prepared as follows:

> Wheat bran, 50 pounds; Paris green or crude arsenic, 2 pounds; blackstrap molasses, 2 quarts; water, 1 gallon, or more as needed.

The poison and the ban, in a dry state, should be thoroughly mixed together, then the diluted molasses is added, and the ingredients thoroughly mixed by vigorous stirring. Distribute this bait broadcast over the infested field, taking care to sprinkle it sparingly around each plant.

Reference:
Luginbill, P., and Ainslee, G.G. The Lesser Corn Stalk-Borer.
U. S. Dept. Agr. Bull. 539, 27 pp., illus. 1917.

## EAGLE NONSENSE AGAIN

Following a recent news article alleging that an Eagle tried to kidnap a nine-month-old baby in Hugo, Minn., the Audubon Association investigated and has a report from its Field Representative, J. P. Jensen, of Dassel, Minn., as follows:

"Here are the facts in the Hugo 'Eagle and Child' case: A Golden Eagle, with a wingspread of 86 inches, was apparently pursuing a Hawk, and in its flight was caught between two automobiles on the pavement of a city street. It flew upwards and was electrocuted by a high-tension wire just above. The bird was only slightly burned on one wing and is being mounted by Mr. Arnold Lindberg. The baby in the case, and its mother, were *at the time of the Eagle incident 260 miles away visiting and the story as given to the papers was told as a joke.* Mr. Lindberg later left a note stating the facts, and, in company with his brother-in-law, Mr. Charles Harvey, who was with him at the time of the Eagle episode, is willing to supply all details to interested parties."

—From *Bird Lore.*

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[1] Recent observations, made on August 24, 1935, by R. A. St. George and H. R. Johnston of this Bureau, indicate that this damage may be much greater in other localities. While establishing a sample plot at the State Forest Service Nursery located at Clayton, N. C., it was determined that 10 percent of the seedlings had been killed by an insect which was determined testatively as this one.

# Some Wild Flowers of Louisiana

## PART V
## Ferns and Fern Allies

By
**CLAIR A. BROWN,**
**Associate Professor of Botany, Louisiana State University**

Ferns are well known for their decorative uses and are widely grown in our homes as pot plants or are planted in the shady nooks of our gardens. Although they are not flowering plants and hence are not truly "Wildflowers," they are included in this series because they are extremely interesting to many plant enthusiasts. Ferns belong to the division of the plant kingdom called Pteridophytes and differ from the flowering plants in that they do not perpetuate themselves by means of seeds.

According to the geological records, ferns are very old. Fossil remains are found in rocks of the Palaeozoic era which are estimated to be from four to five hundred million years old. Apparently ferns reached their best development during the Carboniferous era, and since then the number of species has apparently decreased. Large ferns, many tree-like in size, were predominating members of the flora of the earth at the time the coal measures were forming.

About six hundred species of ferns are now known throughout the whole world and one hundred and sixty-five species are native to the United States. The Louisiana fern flora is not as rich as that of certain other Southern states, but is richer than most people suspect, especially when one takes into consideration the absence of mountains with their varied flora. At present, about forty-five species of ferns and fern allies have been collected or reported for the State. This article is based upon collections in the Louisiana State University Herbarium, records in the literature, and the collections of the writer.

Ferns grow in a wide variety of habitats. Most of them prefer rich, moist, shady woods, but some prefer to eke out an existence in the crevices of rocks; a few are abundant in the open, sunny, almost barren fields; one cloaks the trunks and branches of trees in Louisiana with a mantle of green in wet weather; another floats on the surface of ponds and sluggish bayous; and a few live partially submerged in shallow water.

### How Ferns Grow

The underside of most fern fronds is covered at certain times with numerous small brownish spots *(Sori)*. In these sori, in special sacs *(Sporangia)* spores are formed (Fig. 11). Usually the sporangium is mostly, though not completely, surrounded by an irregular, thickened wall. This wall absorbs water and straightens out, and this causes the sporangium to rupture and liberate the spores (Fig. 10). The tiny spore germinates under suitable moisture conditions and grows into a flat, thin, more or less heart-shaped structure called a *prothallus*. This prothallus, scarcely as large as a lead pencil eraser, is green and lives an independent existence. On the prothallus are borne the sex organs, the antheridia and the archegonia. The antheridium liberates the motile sperm (male) in a drop of water. The sperm swims to the archegonium where it unites with the egg cell. This fertilized egg then develops into a tiny sporophyte plant (Fig. 2) which grows into the fern, which will again produce spores when mature.

Many ferns exhibit a definite preference for certain habitats, and others grow in many diverse habitats, as long as conditions are suitable for their growth. The following is a list of Louisiana ferns and fern allies by habitats.

Aquatics—Some ferns live floating on the surface of the water or by rooting in mud at the bottom of ponds, lakes, and bayous.

Azolla caroliniana
Ceratopteris deltoidea
Marsilea vestita

Marshes—Lands which are wet, and on which grasses, sedges, and rushes are the dominant plants.

Anchistea virginica
Onoclea sensibilis
Osmunda regalis
Dryopteris Thelypteris

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The writer wishes to express his appreciation to Miss Sue Brown, who made the illustrations.

Swamps—Wet wooded areas which are more or less inundated the year around.

Osmunda regalis
Onoclea sensibilis
Selaginella apus
Botrychium obliquum
Dryopteris normalis

Bogs—Wet wooded areas which are very similar to swamps, but they usually contain more decomposing organic matter and have poorer drainage.

Osmunda regalis
Osmunda cinnamomea
Lorinseria areolata
Onoclea sensibilis
Dryopteris normalis
Athyrium angustum
Athyrium asplenioides

Moist woods—Areas which are better drained than swamps or bogs.

Adiantum pedatum
Selaginella apus
Selaginella ludoviciana
Asplenium platyneuron
Athyrium angustum
Athyrium asplenioides
Botrychium virginianum
Ophioglossum vulgatum
Polystichum acrostichoides
Dryopteris hexagonoptera
Dryopteris patens
Dryopteris normalis
Asplenium pycnocarpon
Osmunda cinnamomea
Onoclea sensibilis
Botrychium obliquum

Pine hills—The rolling hills covered with pines and certain hardwoods; the longleaf pine hills; and the shortleaf pine uplands.

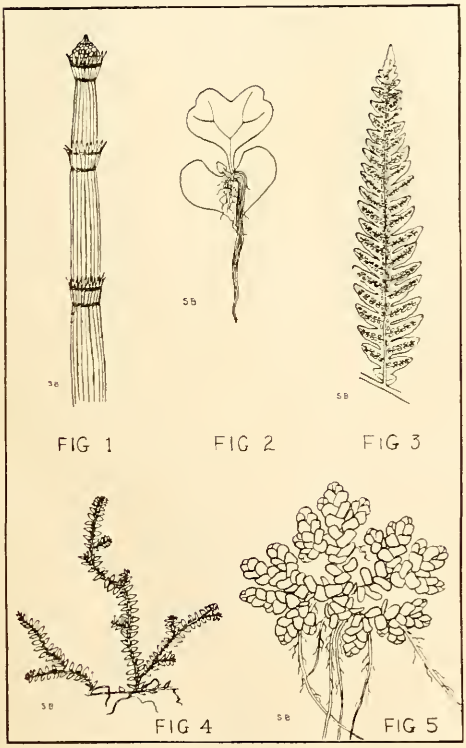

Fig. 1. Horsetail, **(Equisetum robustum)**. One-half natural size.
Fig. 2. Prothallus and young sporophyte of Shield Fern. **(Dryopteris normalis)**. Seven times natural size.
Fig. 3. Pinna of Virginia Chain Fern, **(Ancbistea virginica)**. One-half natural size.
Fig. 4. Little Club Moss, **(Selaginella apus)**. Natural size.
Fig. 5. Azolla, **(Azolla caroliniana)**. Four times natural size.

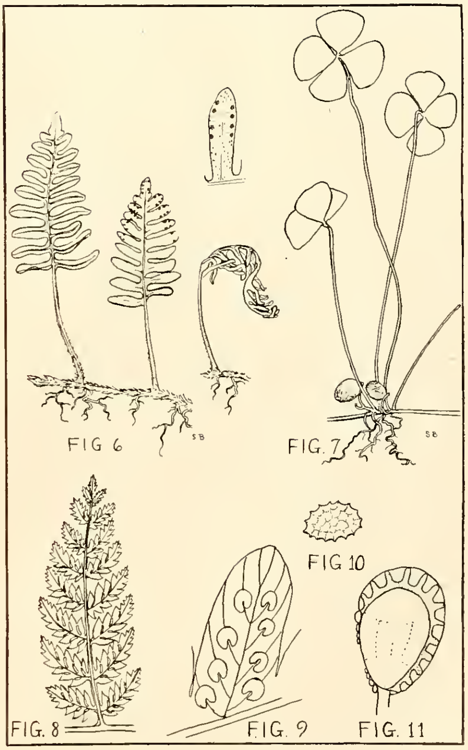

Fig. 6. Resurrection Fern, **(Polypodium polypodioides)**. Expanded and shriveled fronds nearly natural size. Pinna twice natural size.
Fig. 7. Pepperwort, **(Marsilea vestita)**. Natural size.
Fig. 8. Lady Fern, **(Athyrium angustum)**. Pinna natural size.
Fig. 9. Pinnule of Shield Fern, **(Dryopteris normalis)**. Six times natural size.
Fig. 10. Spore of Shield Fern, **(Dryopteris normalis)**. Two hundred and fifty times natural size.
Fig. 11. Sporangium of Shield Fern, **(Dryopteris normalis)**. One hundred times natural size.

Pteris caudata
Pteris latiuscula
Lycopodium alopecuroides
Botrychium obliquum
Dryopteris normalis
Dryopteris patens
Ophioglossum Engelmannii

Rock outcrops—These are quite scarce in Louisiana but limestone, a favorite habitat for many ferns, is exposed near Winnfield in Winn Parish and at Pine Prairie in Evangeline Parish. A rock formation extends across Sabine, Natchitoches, and Winn Parishes, and will probably yield ferns which are not yet known to occur in Louisiana.

Cheilanthes alabamensis
Pellaea atropurpurea
Asplenium resiliens

Old brick or stone walls—On old brick walls and tombs in cemeteries one can often find introduced species which are persisting as escapes from cultivation.

Adiantum Capillus-Veneris
Pycnodoria vittata

Pine flatwoods—These are relatively level and poorly drained areas covered with pines.

Pteris latiuscula
Pteris caudata
Lycopodium carolinianum
Lycopodium alopecuroides
Lorinseria areolata
Anchistea virginica

### CULTIVATION OF FERNS

Ferns can be grown easily in our homes. The tender ones should be protected from extremes in temperature and moisture. Most of them should not be exposed to direct sunlight, especially while the foliage is wet, as they are easily scorched by the sun. They may be propagated by spores, division of the rootstalks, or by means of special vegetative structures on the fronds. Those with creeping rootstalks can be transplanted successfully if moved before new growth starts in the spring, or throughout the season if care is taken.

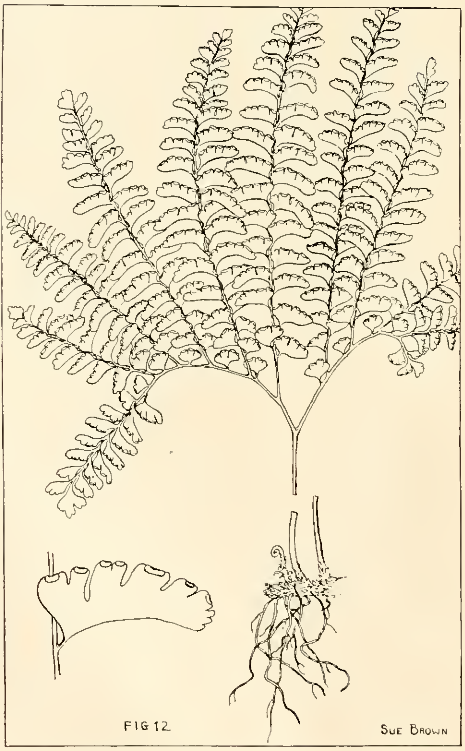

Fig. 12. Maidenhair Fern, (**Adiantum pedatum**). Frond one-half natural size. Pinna twice natural size.

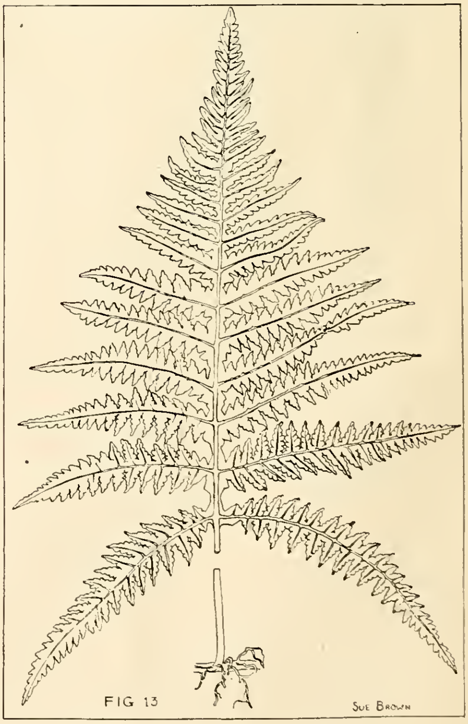

Fig. 13. Broad Beech Fern, (**Dryopteris hexagonoptera**). One-third natural size.

Ferns which grow from a central crown are best transplanted in the dormant stage.

Nearly all of our native ferns can be grown in the garden if proper soil, moisture and shade relations are maintained. The conditions under which they make their best growth in nature are worth studying for best results in fern culture. The soil should be a rich loam. Some growers use a mixture of fibrous loam and leafmold, to which small amounts of sphagnum and charcoal are added.

The following species are shade-loving, and can be raised successfully on a moist rich soil:

Asplenium platyneuron
Athyrium angustum
Athyrium asplenioides
Lorinseria areolata
Anchistea virginica
Dryopteris hexagonoptera
Dryopteris normalis
Dryopteris Thelypteris
Selaginella apus
Marsilea vestita
Polystichum acrostichoides

*Osmunda regalis* and *Osmunda cinnamomea* require more water than the above mentioned species. *Marsilea vestita* which normally grows on wet mud or in shallow water has grown remarkably well this past summer in a shady site which was too dry for the best development of *Onoclea sensibilis.*

The following do well in open sun if sufficient moisture is available:

Osmunda cinnamomea
Osmunda regalis
Pteris latiuscula
Pteris caudata
Onoclea sensibilis
Equisetum robustum

## Fern Structure

To understand a fern it is necessary to have some knowledge of its structure and development in its native habitat. The structure of ferns differs considerably from that of flowering plants. The stems of ferns, which are called *rootstalks,* are usually underground and are quite variable in different species. The petiole of the leaf is

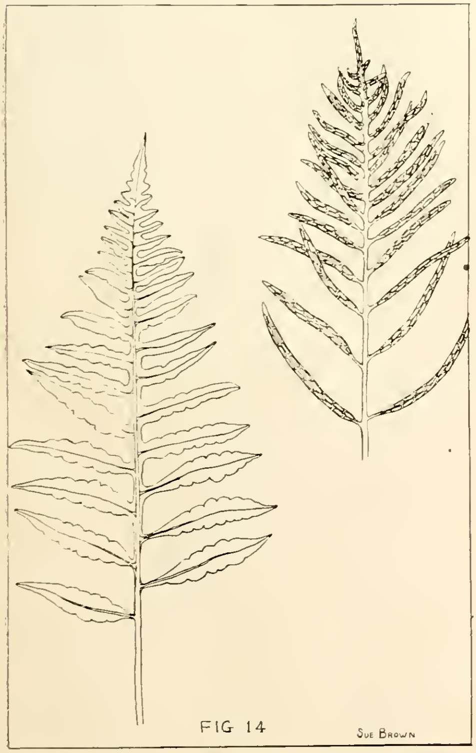

FIG 14

Fig. 14. Net-veined Chain Fern, (**Lorinseria areolata**). One-fourth natural size.

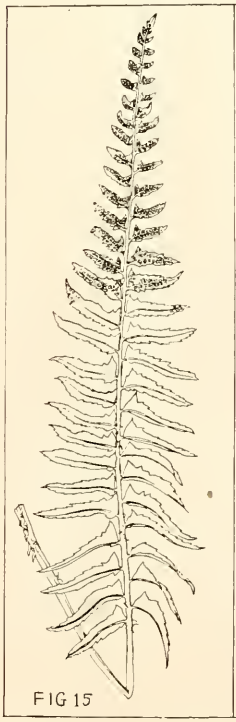

FIG 15

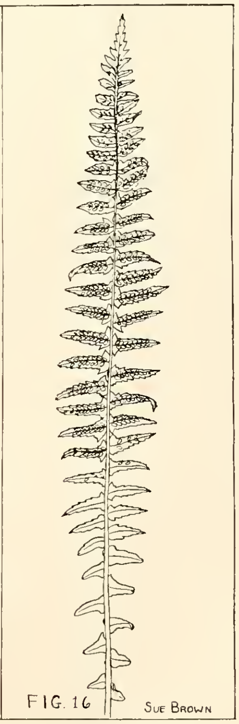

FIG. 16

Fig. 15. Christmas Fern, (**Polystichum acrostichoides**). About one-fourth natural size.

Fig. 16. Ebony Spleenwort, (**Asplenium platyneuron**). One-half natural size.

called a *stipe,* and the blade is called a *frond.* These may be variously modified. The young fronds are coiled and unroll as they develop (Fig. 17). The similarity of a partially uncoiled frond to the head of a bishop's staff resulted in its being called a *croiser.* The frond may be simple, undivided as in *Ophioglossum,* or it may be divided into segments as in most of the other ferns. The division of the frond into segments results in a delicacy of form which has an aesthetic appeal. These variations in the divisions are used in the descriptions of the fronds and help us to identify the ferns. When the margin of the frond is cut to form lobes that extend to the midrib, it is said to be pinnate, and each division is called a *pinna* (plural pinnæ) (Fig. 3). If the pinnæ are cut to their midribs, the frond is twice cut or *bipinnate* and each segment is a *pinnule* (Fig. 9). In case the divisions do not extend more than half way to the midrib, the frond is *pinnatifid,* and when the pinnæ are not completely divided, *bipinnatifid.*

Fronds which produce spores are fertile, and are called *sporophylls.* Several ferns have sterile and fertile fronds which are different in appearance; but in others, the fertile and sterile fronds are essentially alike. The spores are produced in *sporangia* (clusters of which form the *sorus)* (plural, *sori*). The position, shape, size and placement of the sorus on the frond are some of the features used in the classification of ferns. Many ferns have a thin membrane (the *indusium*) which covers the sorus. This may be attached by the center, by the margin, or may be absent. In some ferns the margin of the frond is modified to form the indusium.

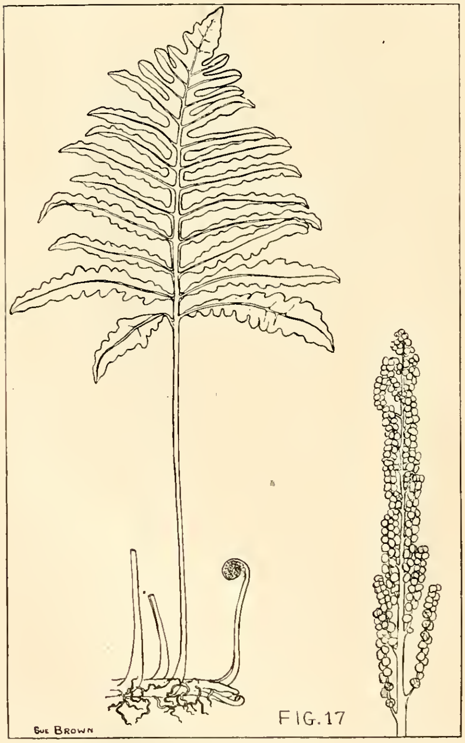

FIG. 17

Fig. 17. Sensitive Fern, (Onoclea sensibilis). Sterile frond one-half natural size.

### Identification of Ferns

Keys are usually used for the identification of ferns. The key is made up of pairs of statements, one true, the other false insofar as any particular individual plant is concerned. The number at the end of a statement refers to the next pair of statements to be used for the plant under consideration. Follow the true statements until one leads to a generic name. If no mistake has been made, that is the genus to which the plant belongs.

### Key to the Genera of Native Ferns and Fern Allies Found in Louisiana

1. Plants aquatic or semiaquatic............ 2
1. Plants epiphytic or terresterial........... 4
    2. Plants rooting in mud, four-foliate leaves. *Marsilea*
    2. Plants free floating................ 3
3. Plants with minute leaves, branched stems seldom over one inch long. *Azolla*
3. Plants with stout petioles, broad blades, 5-15 inches long. *Ceratopteris*
    4. Spore bearing leaves in distinct cone shaped structures ................ 5
    4. Spore bearing leaves not in cone shaped structures ........................ 7
5. Stem leafless, hollow, jointed. *Equisetum*
5. Stems leafy, solid, not jointed............ 6
    6. Plants densely covered with narrow, pointed leaves. *Lycopodium*
    6. Plants with flattened tiny leaves, appearing alternate. *Selaginella*
7. Spores borne on fertile spikes or modified leaf parts ........................ 8
7. Spores borne on the backs of fronds......11
    8. Sterile part of frond entire. *Ophiglossum*
    8. Sterile part of frond more or less divided ........................... 9
9. Fronds arising from fleshy roots. *Botrychium*
9. Fronds arising from well developed rootstalks .........................10

10. Fronds scattered along creeping rootstalks. *Onoclea*

10. Fronds clustered on thickened rootstalks. *Osmunda*

11. Fertile and sterile fronds unlike. *Lorinseria*

11. Fertile and sterile fronds essentially similar ............................12

12. Sori naked .......................13

12. Sori covered with an indusium.......14

13. Plants epiphytic. *Polypodium*

13. Plants terrestrial. *Dryopteris hexagonoptera*

14. Margin of frond modified to form indusium .......................15

14. Indusium distinct from margin of frond ..........................18

15. Sori distinct, lobes of leaflets recurved as indusia. *Adiantum*

15. Sori contiguous or a continuous marginal band ...........................16

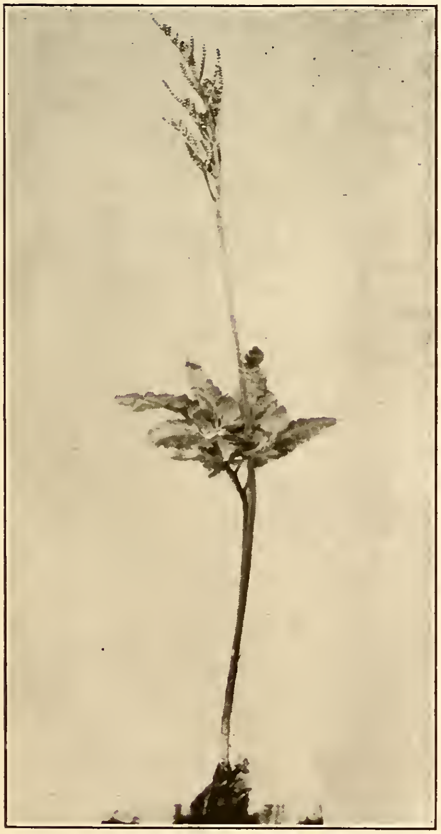

Fig. 18. Grape Fern, (Botrychium obliquum). Natural size.

16. Large coarse ferns in sandy or barren soils. *Pteris*

16. Small ferns on cliffs and rock crevices ..........................17

17. Stipes dark colored, shining, divisions of frond large and few. *Pellaea*

17. Stipes densely chaffy, divisions of frond small and numerous. *Cheilanthes*

18. Sori elongated ....................19

18. Sori round .......................21

19. Sori parallel to midrib of the frond. *Anchistea*

19. Sori obliquely arranged ................20

20. Leaves mostly evergreen, sori usually straight. *Asplenium*

20. Leaves mostly herbaceous, sori curved. *Athyrium*

21. Indusium attached by the margin. *Cystopteris*

21. Indusium attached at the center.........22

22. Indusium peltate, without a sinus, terminal pinnae fertile. *Polystichum*

22. Indusium kidney shaped, with a sinus, all pinnae more or less fertile. *Dryopteris*

## *OPHIOGLOSSACEAE*

The Adder's Tongue Family.

*Botrychium obliquum* Muhl.—Grape Fern, Moonwort. (Fig. 18).

Plants vary from four to twenty inches high. They have fleshy roots with following year's bud enclosed in the short fleshy upright rootstalks. The sterile part of the frond is bipinnately compound coming from the same stem as the long stalked fertile spike. Numerous globular sporangia are borne on the fertile spike.

It fruits from September to November. Widely distributed, but not common, in swamps, pastures, and pinelands.

*Botrychium virginianum* (L.) Sw.—Rattlesnake Fern, Virginia Grape Fern.

This species is larger than *B. obliquum,* and often reaches a height of thirty inches. The membranaceous fronds are ternately divided. It fruits in April and May and is common in moist woods.

*Botrychium biternatum* (Suvigny) Underw.—Grape Fern.

This rare species was collected by Drummond about 1833 and apparently has not since been collected. It is supposed to fruit in March and April.

Four species of Ophioglossum are known to occur in Louisiana. These are rare ferns because they are inconspicuous as well as being small. They are seldom over six inches tall, and often only two or three, thus they are hidden by the surrounding vegetation.

*Ophioglossum crotalophoroides* Walt. — Adder's Tongue Fern.

Small terresterial plants from two to five inches high arising from globose rootstalks. The sterile part of the frond is ovate, undivided, and abruptly narrowed at the base. The fertile spike is stout, three to four millimeters in diameter at the apex where the sporangia are partially embedded in the rachis.

This species was collected by Drummond in New Orleans, by Hale in western Louisiana, and was found in March 1928 on the Indian Mounds on the campus of Louisiana State University by the writer. His specimens are now in the Herbarium of the University of Michigan.

*Ophioglossum vulgatum* L.

The apex of the sterile fronds varies from obtuse to acute, and the base is gradually narrowed.

This species was reported from Louisiana by Clute & Cocks. It fruits in March and April.

*Ophioglossum Engelmannii* Mett.

The apex of the sterile fond is apiculate and the base is gradually narrowed.

Dr. Hale, an early botanist, collected this species at Natchitoches, Louisiana.

*Ophioglossum tenerum* Mett.

The sterile fronds are abruptly narrowed at the base and the fertile spike is less than two millimeters in diameter.

Drummond collected this species in New Orleans in 1833.

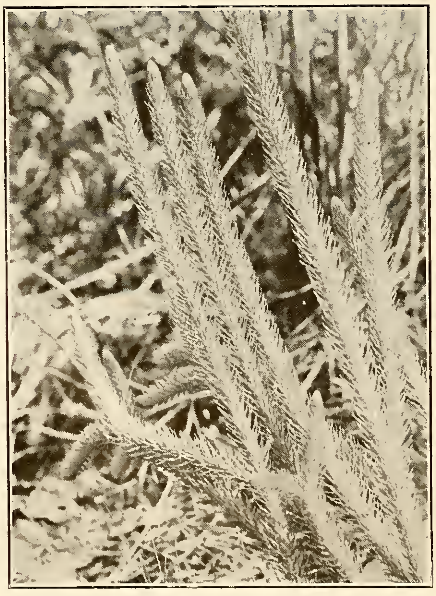

Fig. 19. Foxtail Club Moss, (Lycopodium alopecuroides). About natural size. Young plants before fruiting spikes have developed.

## *OSMUNDACEAE*

### The Flowering Fern Family.

*Osmunda regalis* L.—Royal Fern.

Leaves clustered on a thickened rootstalk and often attain a height of six feet. The fronds are bipinnate with large serrulate pinnules. The tip of the frond is modified for the production of spores. It fruits in April and May. Widely distributed in the State in moist woods, swamps and marshes. Most abundant in the southern part of Louisiana.

*Osmunda cinnamomea* L.—Cinnamon Fern.

Leaves are clustered on a thickened rootstalk and often attain a height of five feet. The sterile fronds are bipinnatifid. Fertile fronds are produced in the center of the crown. These are bipinnate, cinnamon colored, and soon wither.

It fruits in April and May. Common in bogs and stream bottoms of the pine hills. This species can be readily distinguished from the Royal Fern by the smaller less divided pinnae of the sterile frond and the presence of two types of fronds.

## *SCHIZAEACEAE*

### Climbing Fern Family.

*Lygodium palmatum* (Berhn.) Sw. — Hartford Fern, Climbing Fern.

This species is cultivated in Louisiana, and may be recognized by the climbing or twining leaves. The leafy parts consist of stalked, palmately lobed, secondary pinnae borne in pairs. The fertile pinnae are smaller than the sterile pinnae.

## *CERATOPTERIDACEAE*

### Floating Fern Family.

*Ceratopteris deltoidea* Benedict. (*C. thalictroides* of Louisiana reports).—Floating Fern.

Soft, succulent, partly submerged plants with deltoid fronds fifteen to twenty inches long, which vary from pinnatifid to bipinnate. The sporophylls are much narrower and often are thirty inches long.

This is a rare tropical fern and is known in the United States only from Florida and Louisiana. It was first collected in Louisiana by Dr. J. Joor. 1892, at West End near New Orleans. Later, R. S. Cocks collected it in Lake Pontchartrain and in 1901, W. N. Clute found it at West End. It has not been reported since the report of Clute and Cocks, but may still exist in that vicinity if the locality has not been destroyed.

### *POLYPODIACEAE*

*Polypodium polypodioides* (L.) Hitchc. *(P. incanum)*.—Resurrection Fern (Fig. 6).

An epiphytic fern creeping by the means of slender rootstalks. Fronds lanceolate to oblong, pinnate, bright green and expanded when wet. Grayish and curled when dry. Stipe and underside of frond scaly. Sporangia borne in naked sori on the under-surface of the frond.

This is the only epiphytic fern known to grow in Louisiana. It is able to resist long periods of dry weather, at which time it is shriveled and curled. After a good soaking rain it expands and becomes bright green. Sori can be found throughout the year. It is widely distributed in lower Louisiana on the bark and branches of trees, especially live oaks. In the northern part of the State it occurs on trees in swamps and along streams.

*Pycnodoria vittata* (L.) Small.

This fern closely resembles the common Bracken *(Pteris latiuscula)* and has been reported for Louisiana as *Pteris longifolia*. It is an escape from cultivation and maintains itself on old brick walls, and on the tombs in the cemeteries of New Orleans. This genus has a single indusium over the continuous marginal sori, whereas *Pteris* has a double indusium.

*Pteris latiuscula* Desv. (*Pteris aquilina* of early reports).—Bracken.

The horizontal rootstalks are stout and woody. The straw colored stipes are one to two feet long, and support three main divisions of the frond, each of which is bipinnately divided. Fronds vary from one to three feet long. The sori are marginal and each is covered with a double indusium.

It fruits in summer and fall. Widely distributed, although not common on alluvial soils.

*Pteris caudata* L.—Bracken.

This species has linear terminal pinnae and veins which fork only once, whereas *P. latiuscula*, which is so similar, has ovate to lanceolate terminal pinnae and veins which fork two or three times.

This species is more abundant in the pine flatwoods and is widely distributed on the pine hill soils of northern and western Louisiana.

*Adiantum pedatum* L.—Maidenhair Fern (Fig. 12).

The fronds arise from creeping rootstalks. The shiny dark brown stipe forks once at the summit and the branches re-fork to form a frond which is circular in shape. The leaflets are triangular-oblong and the upper margin is curled under to form the covering for the sporangia in the sori. It fruits from May to November.

This very graceful fern is a northern plant which has its southern limits in Louisiana. It has been collected in shady, moist ravines in the Feliciana parishes.

*Adiantum Capillus-Veneris* L.—Venus hair Fern.

This is closely related to *A. pedatum* and is the species commonly grown in Louisiana. It persists as an escape on some of the old tombs in the cemeteries of New Orleans. The stipe of this species is not forked, and the leaflets are narrower and more ovate in shape than those of *A. pedatum*.

*Cheilanthes alabamensis* (Buckl.) Kuntze. Alabama Lip Fern.

This is a rock loving fern. The creeping rootstalks are covered with brownish hair-like scales. The leaves grow from five to fifteen inches long. The stipes are blackish with brown hairs at the base. The fronds are glabrous, bipinnate. The sori are marginal and are covered by the indusium formed from the revolute margin.

This species was collected on limestone rocks at Winnfield, La., by N. F. Peterson in April, 1912. This is the first record for the State.

*Pellaea atropurpurea* (L.) Link. — Purple-stemmed Cliff Brake.

This is a rock loving species with short rootstalks, numerous fibrous roots and stiff leaves. The stipes are purple-black, and the fronds are coriaceous. The young frond may be simple, trifoliate, or pinnate. The older fronds are more

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conspicuously pinnate. The fertile fronds are narrower than the sterile ones. It fruits in May. The continuous sori are nearly covered by the revolute margin.

Collected by N. F. Peterson in 1912 on limestone rocks at Winnfield, Louisiana. This is the first record of its occurrence in the State.

*Anchistea virginica* (L.) Presl.—Virginia Chain Fern (Fig. 3)

Arching leaves one to three feet long grow from a slender, creeping rootstalk. The purplish-brown stipes are large, but quite fragile. The ovate lanceolate frond is from one to two feet long, ten to twelve inches wide, and bipinnatifid. The sori are elongated, and arranged in parallel rows on each side of the rachis and midrib of the pinnae. It is because of this particular arrangement of the sori, similar to that of chain stitching, that the plants are called Chain ferns.

This species prefers moist marshes and is common around Lake Pontchartrain and in the Grand Marais near New Iberia. It is rarer in bogs in the northern part of the state. It fruits from April until frost.

*Lorinseria areolata* (L.) Presl.—Net-veined Chain Fern. (Fig. 14).

This fern produces sterile and fertile fronds from creeping root-stalks. The fertile fronds are pinnately divided, one to two feet tall, with minutely serrate margins to the pinnae. The fertile fronds are taller than the sterile ones and the linear pinnae are much narrower. The sori are elongated in pairs on the lower surface. It fruits from July until frost.

This species is widely distributed in Louisiana in most bogs and stream bottoms of the pine hill sections of the State. It is practically absent from the alluvial and bluff soils. The sterile frond is similar in appearance to that of the Sensitive Fern (*Onoclea sensibilis*) from which it can be distinguished by the minutely serrate margin to the pinnae.

*Asplenium platyneuron* (L.) Oakes.—Ebony Spleenwort (Fig. 16).

The evergreen leaves are clustered on short rootstalks. The fertile fronds are erect and accompanied by a rosette of smaller, spreading, sterile fronds. The shiny stipes are purplish-brown. The fronds are linear-lanceolate and pinnately divided. The straight sori are linear to elliptical and crowded on the undersurface of the pinnae.

It fruits from March to December and is widely distributed in moist woods.

*Asplenium pycnocarpon* Spreng.—Narrow-leaved Spleenwort.

This species is similar to the Ebony Spleenwort, but differs by the blackish bases to the stipes which are green above. Also the fronds are longer.

It is known only from West Feliciana Parish where it was collected by F. W. Pennell.

*Asplenium resiliens* Kuntze.—Black-stemmed Spleenwort.

This species is characterized by the blackish stipes and erect fertile and sterile fronds.

It grows on limestone rocks at Winnfield, Louisiana, where it was collected by N. F. Peterson in May 1912. This is the first record for Louisiana.

The species in the following genus (*Athyrium*) were once included in the genus Asplenium. Most botanists admit that the separation of these genera is often difficult on the characters generally used. The sori in Asplenium are straight and the leaves usually evergreen, whereas the sori in Athyrium are usually curved and the leaves are herbaceous.

*Athyrium angustum* (Willd.) Presl. — Northern Lady Fern. (*A. felix-foemina* of early reports). (Fig. 8).

Leaves tufted, one to three feet tall on creeping rootstalks, densely covered with persistent bases of old stipes. Stipes straw colored, fronds broadly oblong-ovate to oblong-lanceolate bipinnate. Sori usually curved and covered with the indusia

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which open on the side toward the midrib. Spores brownish, smooth.

It fruits from June to frost. Common in moist woods and bogs in northern Louisiana, rarer in the southern part of the State.

*Athyrium asplenioides* (Michx.) Desv.—Southern Lady Fern.

This species is closely related to the Northern Lady Fern. The rootstalks are not densely covered with the persistent bases of the old stipes. The spores are blackish and reticulated.

It fruits from September until frost and occurs in moist, shady woods and swamps. Its distribution is not fully known.

*Athyrium thelypteroides* (Michx.) Desv.—Silvery Spleenwort.

This species was reported from Louisiana by Riddell in 1852. It apparently has not been collected since and future collecting will be necessary to determine if it really is a part of our fern flora. It has bipinnatifid fronds which will distinguish it from *A. angustum* and *A. asplenioides.*

Six species of Shield Ferns (Dryopteris) have been reported for Louisiana. The following key contains the chief characteristics by which these ferns may be identified.

1. Indusia present........................ 2

1. Indusia absent...*Dryopteris hexagonoptera*
    2. All pinnae essentially spore bearing... 3
    2. Upper pinnae of frond spore bearing *Dryopteris Floridana*

3. Veins of pinnae simple................. 4

3. Veins of pinnae once or twice branched *Dryopteris Thelypteris*
    4. Basal pair of pinnules on each pinnae not conspicuously longer than the others.........*Dryopteris normalis*
    4. Basal pair of pinnules conspicuously elongated........*Dryopteris patens*

*Dryopteris normalis* C. Chr.—Shield fern (Fig. 9)

The horizontal rootstalk produces leaves three to five feet long which grow erect or ascending. Stipes are scaly and pubescent at the base. The fronds are ovate, elliptic and bipinnatifid. The pinnules are ovate to elliptical in shape and the basal pair are not conspicuously longer than the others. The veins of the pinnules are simple. The pubescent indusia are suborbicular. Mature sporangia are blackish.

This is the most common species of the shield ferns in Louisiana. It fruits from mid-summer until frost. In protected places the fronds remain green until spring. Widely distributed in wet woods, swamps, and along streams.

*Dryopteris hexagonoptera* (Michx). C. Chr.—Broad Beech Fern (Fig. 13).

The lower pair of pinnae point downward and away from the stipe at a different angle than the upper pinnae. This gives the frond an arrowhead shape. This species lacks the indusium so characteristic for the genus. Many botanists place this species in the genus Phegopteris. It fruits in late summer and fall. It is apparently rare, but when its distribution in the State is fully known, it may not be classed as rare. It thrives in shady, moist woods and along streams.

*Dryopteris Thelypteris* (L.) Gray.—Marsh Shield Fern.

The oblong-lanceolate fronds of this species are broadest at the base and taper toward the apex of the frond. It is common in marshes; occasional along the borders of moist woods; and most abundant in the southern part of the state.
*Dryopteris patens* (Sw.) Kuntze.

Small in his book "The Ferns of Florida", describes this species with an erect rootstalk and emphasizes the conspicuous, elongated basal pinnules on each pinnae. His comment about its relatively recent discovery in Florida and its limited distribuition leads one to believe that it is different from the material described as *D. patens* in his "Flora of the Southeastern United States." (1913). It appears that the records of *Dryopteris*

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*patens* for Louisiana by Featherman, Clute and Cocks, Langlois, and Pennell apply to what is here interpreted as D. normalis. It is evident that this group needs further study.

*Polystichum acrostichoides* (Michx.) Schott.—Christmas Fern (Fig. 15).

The lanceolate, evergreen fronds are one to two and a half feet long, three to five inches wide, and pinnately divided. The stipes are densely chaffy. The upper pinnae are fertile and smaller than the lower, sterile pinnae. The indusium is peltate.

In some states the evergreen fronds are gathered and sold by the thousands for decorative greens at Christmas time. It fruits from April until late in the fall. It is widely distributed in Louisiana in moist woods.

*Onoclea sensibilis* L.—Sensitive Fern (Fig. 17).

Fertile and sterile fronds come from a creeping rootstalk. The sterile fronds are from one to three feet tall, broadly triangular in shape, and pinnately divided. Occasional fronds have pinnae which are pinnatifid. The margins of the pinnae are entire. The sterile fronds, which are from one to four feet tall, stand above the fertile fronds in late summer and fall, and persist throughout the winter.

The slightest frost will blacken and kill the sterile fronds of this species, hence the common name. It is widely distributed in Louisiana in moist sites. It can grow in the shade or in the open sunshine if sufficient moisture is present.

## *MARSILEACEAE*

### Pepperwort Family.

*Marsilea vestita* Hook & Grev. — Pepperwort, "Water Clover" (Fig. 7).

The slender, horizontal rootstalks are partially buried in wet mud. The leaves consist of a slender stipe and a four-foliate frond. The sporangia are borne in sporocarps, little bean-shaped structures at the base of the stipe. The peduncle of the sporocarp is less than half the length of the sporocarp.

This plant grows in wet mud or totally submerged in shallow lakes and streams. It is widely distributed in lower Louisiana but is seldom collected because most people do not recognize it as a fern. It fruits in April and May.

*Marsilea uncinata* A. Br.

There is one collection of this in the Herbarium of the Louisiana State University. It was collected on a raft in the Mississippi River by Mr. Scott. This is all of the data that is with the plant. This species can be distinguished from *M. vestita* as the stalk of the sporocarp is from two to four times longer than the length of the sporocarp. The fronds in our collections are also larger.

*Azolla caroliniana* Willd.—Carolina Azolla (Fig. 5).

These are small, floating, moss-like plants with pinnately branching stems covered with minute, overlapping leaves. Entire plants vary from one-fourth of an inch to one inch in diameter.

The reddish color of these plants in warm weather makes them conspicuous when thousands of them completely cover a pond. Cocks reported that from June to September fourteen cartloads, weighing perhaps seven tons, were removed from a sheet of water in Audubon Park which had an area of about one-quarter of an acre. This gives an idea of how abundant these tiny plants are at times.

It is common and widely distributed in Louisiana on small ponds, barrow pits, and slowly moving water.

## *LYCOPODIACEAE*

### Big Club Moss Family

Several species of Lycopodium have been reported for Louisiana but much collecting is necessary to determine the distribution and just which species occur in the State.

*Lycopodium alopecuroides* L.—Foxtail Club Moss (Fig. 19).

This species has a stout stem which lies pro-

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cumbent and creeping over the ground. The fertile branches are erect, six to twenty inches long, and bear a single spike at their apices. The leaves are narrowly linear, spinulose pointed, and bristle-toothed on the sides.

It fruits from June to September. It is widely distributed in the moist pine flatwoods and in the bogs of the pine hills.

*Lycopodium carolinianum* L.

This species has leaves of two forms on flattened stems. The stems and sterile branches are creeping. The elongated peduncles, which are terminated by the sporophylls, arise directly from the prostrate stem.

Clute and Cocks report this species for the pine barrens of Louisiana.

### *SELAGINELLACEAE*

Little Club Moss Family

*Selaginella apus.* Spring. — Little Club Moss, Creeping Selaginella (Fig 4).

Stems annual, procumbent, creeping, much branched, with membranaceous leaves of two sizes, the larger spreading horizontally and the smaller appressed to the stem. The fructification is produced at the tips of the branches and can be readily recognized by the more compactly arranged leaves which form an obscurely four-sided spike. Microspores and megaspores are produced in their respective sporangia among the leaves at the tip.

It is widely distributed in Louisiana, in moist, shady woods.

*Selaginella ludoviciana* A. Br.

This species closely resembles *S. apus.* It differs by its stiffer, ascending growth habit, and the larger megasporangia. It is common in the southern part of the Florida parishes.

### *EQUISETACEAE*

Horsetail Family.

*Equisetum robustum* A. Br.—Stout Scouring Rush (Fig. 1).

Rush-like plants, with jointed, hollow, perennial, stout stems from one to six feet tall and from one-half to one inch in diameter. The evergreen stem is furrowed and beset with one row of silicaceous tubercules on the ridges. The leaves are reduced to a few scales terminating the appressed leaf sheath. Black bands mark the base of the sheath and the scales. Spores are borne under the scales of the cone-shaped tip of the stem.

These plants are called scouring rushes because the stems are sometimes used for scouring purposes. Artists use the stems for smoothing plaster models.

This species forms conspicuous patches on the alluvial and prairie areas of Louisiana. While it is widely distributed, it is not abundant.

*Equisetum hyemale* L.—Scouring Rush.

This species is very similar to *E. robustum* but is smaller in size and has two rows of indistinct tubercles on the ridges of the stem. It prefers wet places along streams and ponds. The writer has not collected this species in Louisiana.

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## GULLS, TERNS AND SKIMMERS OF LOUISIANA

Due to considerations of space, the succeeding part of the discussion of Gulls, Terns and Skimmers of Louisiana by James Nelson Gowanloch which is being presented in the Louisiana Conservation Review will appear in the April Number.

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## ONE WAY TO COOK OYSTERS

The following contribution from an Alabama fish and oyster company may interest the readers of the Review:

"A man came down here from the middle of the state and noticed a bunch of men at an oyster counter eating oysters so he went inside to try some. He liked them so well that he shipped his brother a bushel of oysters, writing him and telling him how delicious they were.

"He received a letter from his brother acknowledging receipt of the oysters and telling him that he had washed them thoroughly, gutted them, and cooked them for six hours but that he could not get them soft enough to eat."

# *GEOLOGICAL SURVEY*

DR. H. V. HOWE, *Director,*
*School of Geology of Louisiana State University*
*and Director, Research Division, Louisiana*
*Geological Survey*

C. K. MORESI, *State Geologist,*
*Louisiana Geological Survey,*
*Department of Conservation*

## GEOLOGICAL BULLETIN No. 6

The Louisiana Geological Survey announces the publication of Geological Bulletin No. 6, entitled *Geology of Cameron and Vermilion Parishes.* Because of the size of the area covered and the number of oil fields and prospects, the bulletin is composed of a number of separate reports by different members of the staff of the School of Geology. The construction of the bulletin has been under the immediate supervision of Dr. Henry V. Howe, Director of the School of Geology and Director of the Research Division of the Louisiana Geological Survey, and Mr. James H. McGuirt, Assistant State Geologist.

Cameron and Vermilion Parishes together form the coastline of Louisiana westward from the great Atchafalaya basin to the Texas border. This bulletin, describing their geology and natural resources, follows similar reports on the geology of Iberia, Lafayette and St. Martin Parishes, which lie immediately to the east. Taken together, these reports present a reasonably complete picture of the geology of coastal southwest Louisiana, a region intensely interesting from a physiographic standpoint because of the comparative youth of its surface features and of the rapidity with which they are changing. The region is likewise of great interest geologically because of the presence of numerous salt domes with their associated accumulations of petroleum. Separate chapters are devoted to the Old Hackberry, East Hackberry, Black Bayou, Cameron Meadows, Calcasieu Lake, and Sweet Lake domes of Cameron Parish and the Gueydan Dome of Vermilion Parish. Fourteen geophysical prospects are also discussed.

The report contains a list of the published maps covering southwest Louisiana and a complete bibliography.

It is hoped that this publication, bringing together, as it does, much information on an area of the State where oil development is in active progress, will materially aid in the development of the resources, not only of these two parishes, but of the tier of parishes which lies immediately to the north.

## ANTHROPOLOGICAL STUDY No. 1

This bulletin, which will soon be off the press, is the first of a series of publications of the Louisiana Department of Conservation which will present studies in the anthropological sciences pertaining to the Lower Mississippi Valley and especially to the State of Louisiana. The first articles of the series will be reports on investigations into the pre-history of the areas that are being made by Dr. Fred B. Kniffen and J. A. Ford, of the School of Geology, Louisiana State University.

As the first step in unfolding the story of Louisiana before the coming of white men—the beginning of written history—the investigators are trying to discover the relative ages of the styles of pottery decorations which were used by the ancient Indian inhabitants during the different periods of their occupancy. In this way a time scale can be determined that will go far toward clarifying the problems involved and make possible an intelligently directed program of excavation to fill in the outlines of the story. This was explained in a short article in the April, 1935 issue of the *Louisiana Conservation Review.*

Anthropological Study No. 1 deals with excavations into an ancient Indian village site on the plantation of Mr. William Peck near Sicily Island in Catahoula Parish. This field work was done in 1933 in the course of an archaeological survey of northeastern Louisiana, and was financed principally by a Grant-in-Aid from the National Research Council of Washington, D. C.

Studies of material gathered from the surface of village sites in the Louisiana-Mississippi area had indicated that two ancient stylistic periods of Indian pottery, termed the Marksville and Coles Creek Complexes were of different, though contiguous, ages, and that the Marksville was the older. Pottery of both complexes was found on the surface at the Peck Site, and from the unusual depth of the material accumulated there, it seemed possible that one complex might be superimposed on the other. As the oldest would necessarily have been laid down first and would be at the bottom of the deposit, this would definitely demonstrate the relative age of the complexes.

Careful excavations were made in four different parts of the deposit. Each excavation was dug by small hand trowels in sections not more than five inches thick, and the material found in each section or level was saved separately. The decorated potsherds from each section were classified and the percentage compared. These comparisons show a decided trend toward replacement of the types characteristic of the Marksville Complex by those of the Coles Creek Complex. Accompanying changes in vessel form, texture, and paste are pointed out. Evidences were found of the Deasonville Complex, which marks some sites in the Yazoo River valley and west-central Mississippi, and is supposed to have existed contemporaneously with Coles Creek. This material was not sufficient, however, to determine the exact temporal relationship of Deasonville to the other two decoration complexes.

This bulletin is one link in the chain of evidence that must be accumulated in order to build a clear picture of the forgotten history of the state. Anthropological Study No. 2, now in preparation, intends to present the detailed evidence on which the reconstruction of the chronology of ceramic art has been based. It is hoped that this may be followed with reports on excavations which will be made to determine the details of the daily lives of the people who lived in Louisiana in the different periods of the past.

## PROGRESS REPORT ON THE GEOLOGY OF GRANT AND LASALLE PARISHES

Preliminary work on Grant and LaSalle Parishes has been in progress since October 1st, 1935. Dr. H. N. Fist, geologist, Research Division, Louisiana Geological Survey, who is conducting this survey, spent most of the month of October (1935) in the field in the general vicinity of Jena. Since then he has conducted considerable laboratory and research work at the laboratory of the State Geological Survey at Louisiana State University.

The field work was done with the cooperation of Mr. W. D. Chawner, geologist, Research Division, Louisiana Geological Survey, who is conducting a survey of Catahoula and Concordia Parishes. Mr. Chawner suggested traverses which would best show the general geologic relations of the region as well as the necessary correlations with the geology of Catahoula parish. These widely separated traverses will form the basis for the development of more detailed geologic mapping in the near future.

In this work particular emphasis has been placed upon the relationship between the geologic formations and the different physiographic types of the region. A rough, tentative correlation shows that at least three physiographic subdivisions may be made. First, the low lying swampy, southeastern flood plain region, bordered on the north by Catahoula Lake, covers the southern part of LaSalle Parish and a small portion of the southeastern part of Grant Parish. It is marked essentially by low relief, with an elevation of less than 50 feet, and by the presence of flood plain deposits of the Mississippi River and its tributaries. Similar to this region, but considerably less extensive, is the flood plain of the Red River, one of the most fertile agricultural regions in the South.

The hill country marking the outcrop of the Catahoula sandstone constitutes the second main division. It consists of a band of hills, in general 15 miles wide, extending southwestward from the Chalk Hills of northern Catahoula Parish to the Catahoula Lake district and bounded roughly by Funny Louis Bayou on the west and the Mississippi flood plain on the east in LaSalle Parish. From Catahoula Lake the hills extend westward across Grant Parish where their northernmost appearance is in the vicinity of Colfax. The hill country, reaching an elevation of over 200 feet, has the greatest elevation and relief of any section within the parishes. Localized deposits of Citronelle gravels are found in this region. Although the hill section is not agriculturally important it has been noted for its large stands of long leaf pine timber, and the deposits of Citronelle gravel

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in both LaSalle and Grant Parishes are extensively used as road material.

A third physiographic division is the flat lying region of low relief, intermediate in elevation between the hills and the flood plain district. This region lies on the outcrop of the sandy and clayey Vicksburg and Jackson formations north and west of the hills country. It has a maximum elevation of 175 feet and is cut by many sluggish tributaries of the Little River which flow in wide, flat bottomed valleys and tend to make the region swampy. Economically, this region has proved important because of the deposits of oil in the general vicinity of Tullos and Urania.

A laboratory study of many of the clays and sands of the Vicksburg and Jackson formations collected in the course of the field work is now in progress. This study, together with the accumulation of geologic data from well logs and from published material concerning the geology of the parishes, constitutes the second phase of the preliminary work.

## THE CHRISTMAS MEETINGS

Dr. H. V. Howe attended the meetings of the Geological Society of America in New York, December 26-28. As a Fellow of the Society he presented a paper before the main group on the "Stratigraphic Evidence for Gulf Coast Geosyncline."

> "The Gulf Coast region of the United States is the landward side of the most active geosyncline in North America. McGee, 43 years ago, pointed out 'That the Gulf of Mexico was one of the most fortunately situated depositional tracts of the globe for the measurement of isostatic subsidence. . . .' Its northern border drains the earth's second largest degradation tract. These sediments have been concentrated along a narrow zone, paralleling the present shore, and, since the beginning of the Eocene, have accumulated to a thickness which probably exceeds 30,000 feet. There appears to have been only slight fluctuation in the position of sea level during this time. Subsidence has kept even pace with sedimentation, and the conclusion appears inescapable that the region of the present coastline has been depressed under the weight of these deposits to almost three times the present maximum depth of the Gulf of Mexico. The major axis of the Gulf Coast Geosyncline approximately parallels the Louisiana coastline, but a transverse structure, normally referred to as the Mississippi Embayment, extends inland up the valley of the Mississippi. The formations which make up the landward side of the geosyncline are all wedge shaped, thickening rapidly from the outcrop Gulf-ward. Subsurface evidence of this thickening is given for each formation, and conclusions are drawn as to the total thickness of the sidementary column near the axis of the geosyncline."

Dr. Howe is also a Fellow of the Paleontological Society, which held a joint meeting with the Geological Society, and presented to that group a technical paper on the "Foraminiferal Genus Palmula, Isaac Lea, 1833."

Dr. R. J. Russell attended the meetings of the Association of American Geographers, held in connection with those of the American Association for the Advancement of Science in St. Louis, December 30—January 4. At that meeting he was elected Councilor of the Association of American Geographers for a three-year term. His paper, "Deltas of the Mississippi River," dealt primarily with the late Pleistocene and Recent history of the Gulf Coast and eastern interior portions of Louisiana. In this area are evidences of old deltas still preserving characteristic Mississippi River channels and meanders, though now elevated as much as 100 feet above the present river floodplain. After abandoning such channels as the one now partially occupied by Bayou Teche, the most recent deltaic deposits of the River have been concentrated chiefly south and southeast of New Orleans. A very distinct abandoned delta, now largely lost through sinking, extends through St. Bernard Parish and originally reached beyond the Chandeleur Islands. The most recent delta, below Pointe-a-la-Hache, in Plaquemines Parish, is the only advancing part of the Louisiana Coast at present. The very complex shoreline of St. Bernard Parish is the result of submergence of a

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delta surface. The irregular shores of Plaquemines Parish are the result of river deposits advancing faster than the waves of the Gulf are able to drive them inland. The smooth outer shores of the Chandeleurs and of the western Louisiana Coast are the result of retreat of shores before the activities of advancing waves. Dr. Russell also attended sessions of the American Meteorological Society, to which he belongs, but was unable to attend the Geological Meetings because of conflicting dates. He is also a Fellow of the Geological Society.

Dr. Fred B. Kniffen also attended the meetings of the Association of American Geographers and presented a paper, "An Approach to Culturogeographic Regions." Dr. Kniffen is a member of the Association. His study, based on a morphologic classification of 15,000 individual houses widely distributed along Louisiana highways, indicated the practicability of determining cultural regions on the basis of house types. People build houses of characteristic form, dependent upon the cultural environment in which they live. In the pine hills of Louisiana there is a dominance of houses characterized by an open passageway running from front to rear. In the alluvial lowlands devoted to agriculture there is a marked dominance of houses exhibiting the feature of a built-in front porch. Along the coastal bayous, in settlements occupied by fishermen and trappers, occurs the characteristic narrow, elongated house that immediately suggests a house boat. The modern bungalow is now found in every part of the State, and threatens eventually to obscure the regional contrasts in house types, now so apparent.

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### OIL POLLUTION AND OYSTER BEDS

(Continued from Page 1)

both in the field and in the laboratory. Robert O. Smith, with a staff of assistants, conducted a preliminary hydrographic survey of the areas wherein damage was reported. Through the failure of the Federal Government to provide extensive funds which had been promised for this purpose, an elaborate program planned to investigate these and other aspects very fully in the field was terminated before even the hydrographic portion was completed.

The laboratory experiments conducted with crude oil obtained from the Louisiana wells were carried out under the direction of Dr. Paul S. Galtsoff, who is in charge of all the oyster investigations of the Federal Government and who justly bears the reputation of being the world's foremost oyster authority. These investigations, the work of Dr. Galtsoff himself, of Robert O. Smith and of Dr. Vera Koehring, gave convincing and invaluable results.

It is not possible in a brief editorial comment such as this to enumerate either the experiments or the conclusions with any adequacy. It must be sufficient to state that three illuminating conclusions were reached.

First, Galtsoff and Smith clearly established that the contact of oil with sea water releases into the sea water some yet unknown substance tentatively termed a "water soluble extract." It is unnecessary for the oil to come into actual contact with the oysters, and it is clearly proven that a given quantity of oil continues with repeated contacts with sea water to give off an undiminished amount of this poisonous water soluble extract. In one experiment oil was washed 28 times in succession, the last washing giving a result equally as poisonous as the first.

Second, the experiments of Galtsoff and Smith clearly demonstrated at least one of the mechanisms by which the oyster is damaged. It was clearly proven that sea water containing this soluble extract paralyzes the feeding mechanism of the oyster and, as a result, the oyster will literally starve. Oysters possess complicated feeding organs, one element of which is a multitude of slender microscopic hair-like structures whose motion creates and maintains the "feeding current" which serves to bring in and to secure the oyster's food. The necessary activities of this part of the feeding organs were diminished or even completely abolished by the action of the water soluble extract of crude oil. It is important to note that the shell movements of the oyster (these are also associated with feeding, since a closed oyster cannot feed) were not apparently affected by the water soluble extract. Experiments conducted by other investigators using the opening of the oyster as evidence of normal feeding were, therefore, utterly misleading, since even though the oyster's shell opened into a normal feeding position, the essential food collecting activities of the internal feeding mechanism were, in the presence of this poisonous substance, partially or even completely paralyzed.

Third, Dr. Galtsoff and Dr. Koehring demonstrated a most important further step which is that this water soluble extract of crude oil actually reduces the growth of typical diatoms. Diatoms are microscopic plants which form the major part of the normal oyster's food. They found that the presence of even small quantities of this water soluble extract cut down the growth of the diatoms, and this retardation of growth is directly proportional to the amount of the toxic substance present. A fifty per cent proportion of water soluble extract obtained in a standard manner actually cut down the growth of the diatoms 90 per cent. It is, therefore, clear that in the presence of this toxic pollution by crude oil oysters not only cannot feed, but the growth and abundance of their food is also heavily damaged.

The bulletin also presents the results of oil pollution experiments performed by Dr. Prytherch whose conclusions are in sharp contradiction with those of the other three investigators.

It has been the experience of the Department of Conservation that when industrial or other interests are convinced that they cause damage, such interests do seriously accept their responsibilities and endeavor by every reasonable means to eliminate the causes of damage. It is, therefore, particularly valuable that this 210 page report of crude oil investigations has become available, shedding as it does so much light on a problem of greatest concern to both the oystermen and the oil companies of southern Louisiana.

The administration of both the oil and oyster activities comes under the Department of Conservation of Louisiana. Both represent valuable natural resources and each provides the livelihood, directly or indirectly, for great numbers of our citizens. It is the purpose of the Department of Conservation to ensure as far as is possible that these two essential resources of southern Louisiana can be profitably exploitated without interrelating damage. The Bureau of Fisheries report herein discussed is a splendid contribution to our clearer understanding of a serious matter.

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## HOW MANY DUCKS?

(Continued from Page 1)

tion of vast hitherto impenetrable areas of northern Canada. Accomplishing in hours what would have required weeks or even months of land travel, the investigators were able to secure for the first time duck data regarding this wilderness whose importance as waterfowl breeding grounds is very great.

The duck census was carried out during the month of August, 1935, and showed the following distribution of ducks: In Alberta, 16,400,000; in Saskatchewan, 12,000,000; in Manitoba, 7,500,000; in a portion of the MacKenzie District, 4,600,000. The total for Canada was 40,500,000 ducks. North Dakota totalled 1,200,000; South Dakota, 350,000; Minnesota, 650,000, totalling 2,200,000 for the three States investigated.

Population intensities per unit of area were calculated with the interesting result that southern Manitoba ranks highest with 31.11 ducks per square mile, South Dakota least with 4.5 ducks per square mile. The average population for the whole area of the survey worked out to 16.88 ducks per square mile for the 450,000 square miles.

There is a wealth of other information given in this interesting bulletin. Much study was made of the natural enemies of ducks. Crows were found to be worse of all, being reported by 366 of the 551 observers as being destructive agents. The notable harm they do is the eating of the duck eggs. All accounts indicated that crows are on the increase and that they are particularly numerous along the northern rim of the agricultural area. They appear to be pressing northward their summer range, and are thus extending their destructive activities into regions where the waterfowl were previously unharmed by them. Some crows have even been observed recently beginning the practice of wintering in a few northern lakes where they have learned to survive the hardships of that season by feeding on rough fish and scrap left on the ice by fishermen. Crows are especially bad in the case of early breeding ducks whose nesting places lack the vegetative shelter that later months will bring.

Let us quote some paragraphs from the conclusions of this unusual report:

"In the light of experiences gained during the 1935 International Wild Duck Census, it is entirely practical to take censuses of ducks on their breeding grounds, to arrive at surprisingly accurate figures on duck populations, and, with proper organization of local residents, to obtain also most comprehensive information on the checks to increase during the nesting and growing seasons. Without a proper appraisal of the annual waterfowl 'crop' there can be no proper appraisal of the annual harvest by hunting to be permitted. Without first-hand knowledge of those factors destructive to eggs and ducklings, little information on which to base corrective measures would be available. Authentic knowledge of both the available supply and of checks to increase is essential to a business-like management of our wildlife resources. . . .

"As has been conclusively shown elsewhere in this publication, there is a widespread public interest in work of this kind, numerous cooperators volunteering and accomplishing the work at their own expense. This was true on both sides of the International boundary line.

"Surely such a helpful general interest should be maintained and used constructively in the assembling of information essential to the maintenance of our valuable waterfowl resources and in the accomplishment of corrective measures which their findings indicate to be necessary. Thousands of sincerely interested people are anxious and glad to cooperate in practical field work if proper direction is given them. This fact was not the least of many encouraging results uncovered in the hitherto unexplored field into which the First International Wild Duck Census was launched.

"On the continent as a whole there probably were sixty-five million ducks during August, 1935. This is merely a rough estimate which, if correct, indicates that the total number of ducks is far from satisfactory—and much below what we should have. At least twice as many ducks are needed if we are to regard the duck situation with comfort. With proper management we might have them within the short period of two or three years."

We commend to all students and hunters of waterfowl this stimulating report of an almost herculean task.

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## HOW YOU CAN BECOME A NATURE GUARDIAN

### YOUR PART

Consult your teacher.

Ask that the purpose and plans of the Nature Guardian Club be explained to you and the class.

Ask for an application card.

Get a responsible person to indorse it, after proving that you fully understand the duties of a Nature Guardian.

Sign the application and mail the card postpaid, or give to your teacher, to send with cards from all the class.

### OUR PART

We send the application card.

We send you a handsome badge, a certificate of membership, Nature Guardian pamphlets, and other literature.

This is all free, and is carried on with the purpose of instilling in the children's minds a knowledge of Louisiana's wild life and a thorough understanding of its economic value to the State.

It also aims to develop individual humanitarianism. Even within this short time an amazing improvement has been made in the mental attitude of our young folks toward the conservation and protection of Louisiana's natural resources.

## EDITORIAL

DEAR GUARDIANS:

It is surprising to learn how many people are interested in natural resources. Almost every month brings articles in the better magazines—not necessarily nature magazines—on this subject which stress the importance of their conservation. Many of these articles have to do with fur-bearing animals.

I am sure that nearly all of by Guardians know that the State of Louisiana holds the record for producing more commercial pelts than any other state in the Union.

We owe this distinction to the great number of muskrats produced here. These little animals are the most important fur-bearers that we have, and bring a great deal of money into Louisiana each year.

These pelts are made into very attractive furs that are used for trimmings, for collars and cuffs, muffs, scarfs and coats.

The muskrat pelt is usually tri-colored—silver underneath, golden on the sides, and dark brown on the back. From the silver skins are made the most beautiful garments. When Mrs. Herbert Hoover was the "First Lady of the Land" thousands of our trappers pooled their choicest muskrat pelts and had a very beautiful coat made for her, and several years ago the fur dealers of the State gave Mrs. Huey Pierce Long a beautiful muskrat coat, the pelts that were used in its making being selected by experts from hundreds of skins. Gracious gifts, graciously received.

Muskrat pelts may be changed by dyeing and plucking, into other beautiful phases. When the long "guard" hairs are pulled out, the pelt is sold as "mole-skin." When this so-called mole-skin is dyed a beautiful seal color it is called "Hudson seal," a most high and mighty title for our little Louisiana rat to bear.

Other pelts of great value to the State are those of the gray fox—dyed to become "black fox"—otter, raccoon, opossum and mink, the latter a short-haired variety that is blended by expert furriers into a rich deep brown that is very pleasing.

We should be proud of our fur-bearing animals and should uphold all our hunting and trapping laws, conserving in every way this natural resource of fur-bearers so that Louisiana may continue to maintain her high standing among the fur-producing states of our Country.

With every good wish for all the Guardians, I am,

Cordially yours,
THE EDITOR.

Some of our most interested Nature Guardians, honorary, of course, live in St. Louis. Here is a letter that speaks for itself:

St. Louis, Mo., Nov. 24, 1935.

DEAR EDITOR:

We have been receiving the *"Conservation Review"* and enjoy it very much. I am interested in nature and have a neighbor whom I am very fond of. I wonder if she could be a Nature Guardian? I explained to her and she is interested. Her name is Polish and hard to pronounce so I got her to write it out plainly for you. Her name is Pauline Krutewicz. Please let me know if she can join the Club.

Yours truly,
ANNA REITHEL.

Of course we want Pauline. Ask her to write to us sometime, Anna.

Here is a little note from our very good friend, Mrs. Love, of Franklinton, La. She says:

Kindly send certificates for the enclosed list, and send about twenty-five more application cards.

We had a lovely Nature Guardian Bird Program in our school last week—Birds in Art, Poetry, Pictures, Song and Story.

Sincerely yours,
(MRS.) JOHN M. LOVE.

Here is quite an enthusiastic letter from a New Orleans boy. He writes:

DEAR EDITOR:

I desire to enroll in the Nature Guardian Club. I have always loved our natural friends and I will promise to protect them to the best of my ability. I have read several of your magazines and I assure you that the information I received from them was most helpful.

I am attending a local high school where I have used your magazine to great advantage. I feel sure that many persons in this State are not familiar with the work of the Conservation Department; if they were we would be still further advanced in this great work.

Will you be kind enough to send me an application blank? Thanking you, I remain,

Yours truly,
GEORGE J. FANNING.

Here is that poem by Patrick Breaux that I promised you last quarter:

Behold! here a mighty oak, I stand,
A precious gift from God's own hand.
Planted by a kind little child
Who loves the flowers and trees of the wild.
She watched me grow in her childish way
And I grew to be strong, sturdy and gay.

Now, she brings her old friends to see
The wonderful oak I grew to be.
I shade her from the noonday sun
After her hard day's work is done.
I stretch forth my mighty arms
To chield her from every harm.

Now, boys and girls, let this a lesson be,
Never harm or destroy a tree.
Remember they their duty do—
They are God's friends, like me and you.
Put here for pleasure and comfort, too,
I say, take care of them—PLEASE DO!

Here is a Guardian from Opelousas who wants "Pen-Pals." She says:

DEAR EDITOR:

I received my pin, my certificate and my books. I read the letters and poems sent in by the Guar-

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dians and I hope you will publish my letter and my poem.

Do you think it is a good idea for Nature Guardians to write to each other of the things we have done? I would love to correspond with some of them.

With love,

Flavia Edwards,
Route 3, Box 6, Opelousas, La.

I hope some of the Guardiana will write to Flavia. I know she will have lots of interesting things to write about! Now here is her pretty poem:

Is there anything so lovely as Spring?
  The birds are all happy,
  The flowers are blooming,
And the breezes sweet odors do bring.

The river ripples softly along.
  The daffodils sway,
  The daisies are gay,
As they list to the mockingbird's song.

And so I say goodbye for this quarter. I am sorry that there is not enough space for all the letters and poems, but I hope you will continue to send them in, for we shall be glad to print as many as we can in each issue.

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## WHOOPING CRANE RECEIVES WARM WELCOME IN OUR EXHIBIT

By Ambrose Daigre,
*Departmental Taxidermist*
*Louisiana Department of Conservation*

It will be interesting to ornithologists, bird students and those generally interested in the avifauna to learn that a Whooping Crane, *Grus americana* (Linneaus), was taken in Louisiana near Gueydan in Vermilion Parish. I am saddened to state that it was accidentally killed by a gentleman who mistook it for a goose. He, realizing his error, reported it and sent the specimen in to be mounted. It will be placed on exhibition in our museum at 237 Royal Street, New Orleans, Louisiana.

This is one of the rarest of North American birds, belonging to the order Gruiformes and the family Gruinae. It is also the tallest and most stately of birds found on this continent.

Once plentiful, its numbers have been depleted to the verge of extinction, and today it is an ornithological event to observe a Whooping Crane in nature. It has steadily retreated before an advancing civilization and is now rarely observed summering in Saskatchewan, supposedly the last fragment of its nesting range. Being a frequenter of open areas has caused the Whooping Crane to be extirpated from very much of its former nesting range. Exaggerated by that peculiarity of prairie country which makes distant objects appear twice their normal size and with its large stature, this bird presents a spectacular sight which is not soon forgotten. Coues states that he knew of a man who mistook a Sandhill Crane for one of his mules and went in quest of it. He himself mistook a Whooping Crane, feeding with its broad white stern toward him, for an antelope and proceeded to stalk it, until to his amazement the antelope spread its large black tipped pinions and lazily bore itself away. I have noticed the exaggeration of the size of birds over much of the Louisiana coastal marsh country.

No recent records have been taken of this bird's nesting. According to early ornithologists, its nesting range once included much of the prairie country from Great Slave Lake to Illinois. The nest is built in reedy marsh country. The Cranes pull up the rushes and make their nest from this

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material, leaving open water around the nest. R. M. Anderson, in 1894, says that he observed two drab-and-spotted eggs in such a nest after having seen a pair of the great white birds in the adjacent country.

This Crane's diet consists of both vegetable and animal matter. According to Audubon, the birds were often observed feeding on the roots of the great water lily. It is a known fact that they will subsist on mice, rats, snakes, small alligators, insects, grain, etc.

From a few recent records previously taken, it seems that all of the Whooping Cranes are not yet gone. Let us hope that through the proper conservation and study, these great, useful and interesting birds will long continue to exist on this continent.

## PINTAIL-MALLARD

One of the other interesting specimens that came to me for mounting was a cross between a Pintail, *Dafila acuta tzitzihoa* (Vieillot), and the well known Mallard, *Anas platyrhynchos platyrynchos* (Linnaeus).

This specimen was shot by John T. Upton at Avoca Island near Morgan City, Louisiana, on November 24, 1935.

It is an interesting fact that many kinds of ducks will hybridize. Among most records that come to my knowledge were crosses of the Mallard with other species. The barnyard Mallards that you see are the offspring of some such crosses.

Among species that will hybridize are the Mallard, the Pintail, the Green-winged Teal, Baldpate and Muscovy Duck.

This particular specimen previously mentioned had the markings of both the Mallard and Pintail. Its head had brown and green intermingled and it possessed the elongated tail feathers of the Pintail.

*Garde-soleil* (masculine), the Louisiana-French name for the American Bittern, *Botaurus lentiginosus* (Montagu), is one of the many fascinating Acadian names for wild life analysed by Professor Read of Louisiana State University in his admirable monograph, "Louisiana-French". *Garde-soleil* is an aphetic form of *regarde soleil*, "look at the sun", the equivalent, therefore, of the popular English name, "Sun-gazer".

The Bittern has several other Louisiana-French names, *Butor* (masculine), which sometimes becomes, in Point Coupee Parish, *Bitor*. *Biorque* (masculine), a word apparently connected with the dialectic French *Bior* or *Bihor*, "Bittern", which, in turn, is apparently derived from the Latin *Butio*, "Bittern", and *Taurus*, "bull". This term was doubtless applied to the bird because of its peculiarly hollow note, reminiscent of the distant bellow of a bull. *Couac* (masculine), still another Louisiana-French name for this bird is given in imitation of its alarmed squawk. Incidentally the American Bittern, although a bird of the New World, was, oddly enough, first described for science from a specimen taken in Piddletown, Dorsetshire, England, in 1813.

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*Bayou* (masculine), one of the most familiar terms in Louisiana geography, has an interesting history, as indicated by Professor Read of Louisiana State University. Applied to a sluggish stream, smaller than a river and larger than a *coulée*, *bayou* originates from the Choctaw Indian *bayuk*, "creek" or "river". The Bayou Teche, famous for its association with Evangeline, is really large, however, since it has a length of 175 miles and widens into the dimensions of a river near its junction with the Atchafalaya. So level is the course of some bayous, that they may irregularly reverse their direction of flow. Read cites the example of Bayou Manchac which flows eastward toward the Amite River, and states that, standing on the bridge at Hope Villa in Ascension Parish, ordinarily one may observe this river flowing eastward, but if the Amite is swollen by heavy rains, Bayou Manchac reverses and flows westward toward its former source, the Mississippi.

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